

TITLE**ELONGATE RECEIVER TUBE AND METHOD OF MAKING THE SAME**

This application is a divisional patent application  
5 of U.S. patent application Serial No. 10/096,231, filed  
March 12, 2002, which claims the benefit of U.S.  
provisional patent application Serial No. 60/284,050,  
filed April 16, 2001.

10 BACKGROUND OF THE INVENTION

## Field Of The Invention:

The present invention relates to a trailer hitch  
assembly and more particularly to an elongate receiver  
15 tube for a trailer hitch assembly and a method of making  
the same.

## Description Of The Prior Art:

Trailer hitches employed in conventional motor  
20 vehicles include a receiver tube permanently affixed to  
the motor vehicle and is adapted to receive a removable  
trailer hitch bar. The receiver tube is typically  
affixed to the vehicle frame and may include additional  
cross bracing. The exposed end of the receiver tube is  
25 open to receive the removable trailer hitch bar. A  
mounting ball adapted to receive a trailer tongue is  
typically mounted on the exposed end of the trailer  
hitch bar.

The exposed end of the receiver tube is exposed to  
30 considerable lateral and up and down forces during use.

In order to compensate for these forces, the ends of the receiver tubes have been reinforced. Such reinforcement includes the use of a reinforcement ring which is slid over the end of the receiver tube end and welded in place. Such a welded construction includes a weld bead which is a corrosion site adversely affecting the life cycle of the assembly.

Another method has been developed wherein the trailer hitch receiver tube end was reinforced by a metal forming process. The process is carried out with a tube stock at an elevated temperature of about 1800° F and was upset to form a reinforcement bead around the entire peripheral of the tube. The process is referred to as a "hot upset" operation.

It is an object of the present invention to produce an elongate receiver tube wherein the exposed end is reinforced by a cold forming process to form a crimped reinforcement flange thereon.

Another object of the invention is to produce a method for cold forming a crimped flange on the end of the elongate receiver tube for a trailer hitch assembly.

#### SUMMARY OF THE INVENTION

The above, as well as other objects and advantages of the invention may be readily achieved by an elongate receiver tube and method for making the same wherein the elongate receiver tube for a trailer hitch assembly comprises an elongate tube having an internal

rectangular cross-section and having one end adapted to receive a trailer hitch bar having a complimentary outer rectangular cross-section, the one end of the tube having an integral reinforcement construction wherein  
5 the end of the tube is provided with an outwardly extending fold formed of two thicknesses of the tube including the outermost end portions are folded against one another by a cold forming process to form a peripheral outwardly extending fold at the end of the  
10 tube, the fold having an inner dimension which is the same as the inner dimension of the tube and an outer dimension greater than the outer dimension of the tube.

#### BRIEF DESCRIPTION OF THE DRAWINGS

15 The objects and advantages of the invention will become readily apparent to those skilled in the art from considering the following detailed description of an embodiment of the invention in the light of the accompanying drawings, in which

20 Figure 1 is a fragmentary perspective view of a trailer hitch assembly incorporating the features of the present invention;

Figure 2 is an enlarged fragmentary perspective view of the receiver tube incorporating the present  
25 invention as illustrated in Figure 1; and

Figure 3 is a cross-sectional elevational view of a portion of the tooling required to form the

reinforcement at the end of the elongate receiver tube illustrated in Figures 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is illustrated a trailer hitch assembly generally indicated by reference numeral 10. The trailer hitch assembly 10 typically includes an elongate receiver tube 12, and cross members 14 and 16, connected to respective vehicle frame members 18 and 20.

10 The receiver tube 12 is provided with a hollow interior 22, as clearly illustrated in Figure 2 which receives a trailer hitch bar, not shown. The trailer hitch bar is slid into the interior of the receiver tube 12 until a connecting hole 24 formed in the receiver  
15 tube 12 is aligned with a corresponding hole in the hitch bar to receive an appropriate locking pin. The outwardly projecting end of the trailer hitch bar is typically provided with a mounting ball adapted to support the tongue of an associated trailer.

20 The construction of the receiver tube 12 includes a reinforcement flange 26, which extends completely around the outermost peripheral edge. The reinforcement flange 26 is best illustrated in Figure 3 wherein it is shown that the reinforcement flange 26 is formed of two  
25 thicknesses of the wall of the tube 12 including the outermost end portion 28 which is folded against another thickness 30. The resultant reinforcement includes the peripheral outwardly extending flange 26 formed of the

thicknesses 28 and 30 folded on themselves at the end of the tube 12. The reinforcement flange 26 has an inner dimension which is the same and typically slightly larger than the inner dimension of the tube 12 and an  
5 outer dimension greater than the outer dimension of the outer surface of the tube 12.

The formed reinforcement flange 26 adds strength to the end of the receiver tube 12 to assist in withstanding the stresses applied thereto by the  
10 associated trailer hitch bar during use.

The reinforcement flange 26 is formed by a cold metal forming process wherein the tube stock used to form the receiver tube 12 is placed in a clamp 32 to secure the outside surface to a predetermined length.  
15 Next, a single punch having the same cross sectional configuration as the interior of the receiver tube 12 to be strengthened is inserted into the hollow interior of the tube 12. The outer surfaces of the punch are effective to support the tube 12 during the following  
20 cold forming crimping process. It will be understood that one end of the tube stock extends beyond the clamp 30 to provide sufficient length of unsupported tube stock to form the desired strengthening crimped reinforcement flange 26.

25 Next, a punch is further inserted into the interior of the receiver tube 12 to commence formation of the crimped reinforcement flange 26. The punch is advanced into the hollow tube interior causing equal wall

thicknesses in the end portion of the tube 12 to be forced against the clamp 30 causing the unsupported tube end to be trapped outside of the clamp 30 thus preventing the equal wall thickness of the receiver tube  
5 from being deformed during the cold forming process. The punch is caused to continue the inward movement until a circumferentially outwardly extending shoulder of the punch meets the unsupported end of the tube 12 and continues until the unsupported tube stock folds  
10 outwardly to a developed limit. When the limit is reached, the punch continues and causes the material of the receiver tube 12 to buckle and fold inwardly upon itself until the desired cross-sectional configuration is achieved. The movement of the punch is stopped and  
15 the punch is withdrawn.

It has been surprisingly determined that the cold formed folded upon itself reinforcement flange 26 including the metal stock thicknesses 28 and 30 has increased reinforcement and life cycle characteristics  
20 to any other known receiver assemblies.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be understood that the  
25 invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.